These review questions are for the Cardiovascular system lecture topic. The questions were adapted from several sources, including 1800+ Review Questions for Anatomy and Physiology II (2nd edition) by R. Michael Anson, Ph.D.

You are required to know and understand all the material on the cardiovascular system that is covered in the lecture and in the laboratory. Questions marked with an asterisk are from material presented in the laboratory section of the course.

Multiple choice review questions:

1) Which of the following is **not** considered part of the cardiovascular system?
- A) Heart
- B) Lungs
- C) Blood
- D) Blood vessels

2) The two main loops of the cardiovascular system are _____ loop and the _____ loop. (Choose two correct answers)
- A) Pulmonary
- B) Respiratory
- C) Aorta
- D) Systemic

3) Within the pulmonary loop, the
- A) pulmonary arteries carry oxygen-poor blood.
- B) pulmonary veins carry blood toward the lungs
- C) blood returning to the left atrium of the heart is oxygen-poor.
- D) oxygen from the blood diffuses into the lungs.

4) Which is **not** a blood vessel that directly connects to the heart?
- A) Carotid artery
- B) Superior vena cava
- C) Aorta
- D) Inferior vena cava
- E) Pulmonary artery
- F) Pulmonary vein

5) The atrioventricular (AV) valves
- A) are located between the atria and the vena cava
- B) are located between the ventricles and the aorta
- C) are located between the ventricles and the atria
- D) are located within coronary arteries

6) The semilunar valves
A) prevent the backward flow of blood from the ventricles into the atria.
B) are open during the relaxation phase of the ventricles.
C) are closed throughout the cardiac cycle
D) regulate the passage of blood from the ventricles into the pulmonary artery and the aorta.

7) The terms "systole" and "diastole" usually refer to the
A) contraction phase and relaxation phase of the atria.
B) relaxation phase and contraction phase of the atria.
C) contraction phase and relaxation phase of the ventricles.
D) relaxation phase and contraction phase of the ventricles.

8) The second heart sound ("dup") results from vibrations generated by the
A) opening of the AV valves at the start of diastole.
B) closing of the AV valves at the start of systole.
C) opening of the semilunar valves at the start of systole.
D) closing of the semilunar valves at the start of diastole.

9) The following list of events of the cardiac cycle is NOT in the correct sequence. Which arrangement is the correct order of events?
1 = The ventricles contract
2 = The ventricles relax
3 = The atria contract
4 = The atria relax
5 = All chambers relax

A) 3, 2, 1, 4, 5
B) 1, 3, 5, 4, 2
C) 3, 1, 4, 2, 5
D) 2, 5, 3, 4, 1

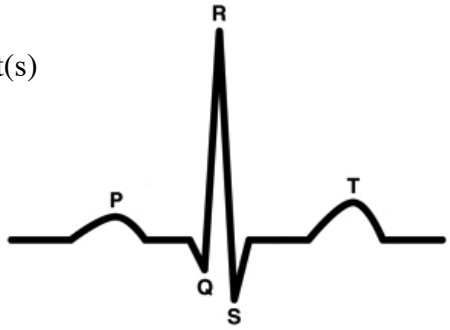
10) The _____ is the normal pacemaker of the heart.
A) AV bundle
B) Left atrium
C) Right atrium
D) SA node

11) Action potentials in heart cells require (and can be altered by) all of these ions except
A) Na^+
B) Cl^-
C) K^+
D) Ca^{2+}.

12) An important function of the AV node is to
A) rapidly transmit action potentials to the surface of the atria
B) delay the conduction of the action potential from the atria to the ventricles.
C) serve as a conduit for rapid transmission of action potentials to blood vessels
D) serve as a pacemaker for the contraction of cardiac muscle.

13*) An ECG measures…
A) The electrical activity of the heart
B) The entire cardiac output
C) The cardiovascular flow rate
D) The cardiac glucose exportation

14*) In the ECG to the right, what event(s) in the heart occur during the P wave?
A) Ventricles contract
B) Ventricles relax
C) Atria contract
D) Atria relax



15*) In the ECG, what event(s) in the heart occur during the QRS complex?
A) Ventricles contract
B) Ventricles relax
C) Atria contract
D) Atria relax

16*) In the ECG, what event(s) in the heart occur during the T wave?
A) Ventricles contract
B) Ventricles relax
C) Atria contract
D) Atria relax

17) The inner most tissue layer of any blood vessel is called the
A) tunica interna
B) medullary cortex
C) stratum hemoderma
D) vasomedia

18) Which of the following statements about arteries and veins is false?
A) Arteries have more smooth muscle for their diameters than do comparable veins.
B) Arteries carry blood transported under higher pressure than blood carried by veins.
C) Only veins have one-way valves to promote flow in one direction.
D) The body changes the diameter of veins to control blood flow to organs

19) The body changes the blood flow to organs mostly through changes in _____
A) vessel radius.
B) blood viscosity.
C) vessel length.
D) pressure differential.

20) The skeletal muscle pump can directly increase
A) cardiac output.
B) blood volume.
C) heart rate.
D) venous return of blood to heart.

21) The exchanges of gases and nutrients between the blood and the tissues occur in blood vessels called
A) arteries.
B) arterioles.
C) capillaries.
D) veins.

22) The average heart rate for an adult at rest is
A) 12 beats per minute
B) 72 beats per minute
C) 80 beats per minute
D) 120 beats per minute

23*) Taking the pulse at the wrist is called taking the _____ pulse
A) Carpel
B) Radial
C) Brachial
D) Humoral

24*) Taking the pulse at the neck is called taking the _____ pulse
A) Carotid
B) Jugular
C) Peripheral
D) Cervical

25*) The “Lub-dup” sounds of the heart come from what part of the heart?

A) Ventricles
B) Atria
C) Valves
D) Arteries

26*) When listening to heart sounds with a stethoscope, abnormal heart sounds (such as gurgles or muffled beats) are known as

A) Cardiac errors
B) Murmurs
C) Incomplete rhythm cycles
D) Infarctions

27) Which term means the volume of blood pumped by each ventricle per beat?

A) Heart volume
B) Stroke volume
C) Venous return
D) Cardiac output

28) During normal ventricular contraction what volume of blood is a typical stroke volume?

A) 5 liters
B) 5 ml
C) 70 ml
D) 1.25 liters

29) Which term means the volume of blood pumped by the heart per minute?

A) Heart rate
B) Stroke volume
C) Systemic current
D) Cardiac output

30) Which factor causes an increase in stroke volume?

A) Increased blood pressure
B) Decreased heart rate
C) Increased force of contraction
D) Increased peripheral resistance

31) What is the correct equation for calculating cardiac output?

A) CO = HR + SV
B) CO = BP - SV
C) CO = Systolic + Diastolic
D) CO = HR x SV

32) At rest the cardiac output of the heart of an average human is _____ liters of blood per minute.

A) three
B) five
C) seven
D) nine

33) If someone's heart has a stroke volume of 0.07 liters (70 ml) and a heart rate of 90 beats/minute, the cardiac output would be

A) 6300 ml/min.
B) 770 ml/min.
C) 70 ml/min.
D) 1.28 ml/min.

34) Blood pressure is the _____ force of the _____ on the _____.

A) Outward, Blood, Blood vessel walls
B) Inward, Blood pressure cuff, patient's brachial region
C) Inward, Blood vessel walls, Blood
D) Outward, Heart contractions, Blood

35) An average adult blood pressure is

A) 12-24
B) 70
C) 72
D) 120/80

36*) The following list of events for taking a patient's blood pressure is NOT in the correct sequence. Which arrangement is the correct order of events?

1 = The sounds of Korotkoff disappear
2 = The systolic pressure is determined
3 = The sphygmomanometer reads about 160
4 = The diastolic pressure is determined
5 = The sounds of Korotkoff appear
6 = The valve on the sphygmomanometer is opened

A) 6, 3, 2, 1, 4, 5
B) 1, 3, 5, 6, 4, 2
C) 3, 6, 5, 2, 1, 4
D) 2, 5, 3, 4, 1, 6

37) The two major factors that determine a person's blood pressure are (select two answers)

A) Heart size
B) Vein lumen diameter
C) Cardiac output
D) Peripheral resistance

38) Which does **not** increase peripheral resistance?

A) Higher cardiac output
B) Smaller lumen size
C) Larger blood volume
D) Atherosclerosis

39) The kidneys increase blood volume by adding _____ to the blood

A) proteins
B) Na^+
C) epinephrine
D) lactic acid

40) Production of angiotensin II would

A) cause vasodilation of arterioles and muscular arteries.
B) inhibit the sense of thirst.
C) cause the kidneys to remove sodium from the blood
D) raise the blood pressure.

41) Increased salt in diet leads to increased blood pressure by

A) Increasing the strength of heart muscle contraction
B) Osmosis of water into blood vessels
C) Causing blood vessels tunica media to constrict
D) Decreasing the water content of the urine

42) A person who does not have chest pain but who suffers from constant pulmonary edema, shortness of breath, and fatigue is most likely to have

A) heart attack
B) anaphylactic shock.
C) fibrillations
D) congestive heart failure.

43) The disease _____ is defined as plaques (fatty deposits) in the arteries. (Hint: This question is asking the name for plaques in the arteries, NOT the effect of having the plaques).

A) Cardiovascular edema
B) Congestive heart failure
C) Atherosclerosis
D) Chronic hypertension

44) Blood pressure that is consistently above 140/90 is defined as _____.

A) Cardiovascular edema
B) Congestive heart failure
C) Atherosclerosis
D) Chronic hypertension

45) This substance is called a clot buster, and is often immediately given to people suffering from a heart attack or stroke.

A) anti-embolane
B) thrombin
C) TPA (tissue plasminogen activator)
D) fibrin

46) For a person with severe allergies to bee venom, a bee sting is most likely to cause

A) congestive heart failure
B) anaphylactic shock.
C) heart attack
D) acute hypertension

Answer to multiple choice review questions:

1 = B
2 = A and D
3 = A
4 = A
5 = C
6 = D
7 = C
8 = D
9 = C
10 = D
11 = B
12 = B
13 = A
14 = C
15 = A and D
16 = B
17 = A
18 = D
19 = A
20 = D
21 = C
22 = B
23 = B
24 = A
25 = C
26 = B
27 = B
28 = C
29 = D
30 = C
31 = D
32 = B
33 = A
34 = A
35 = D
36 = C
37 = C and D
38 = A
39 = B
40 = D
41 = B
42 = D
43 = C
44 = D
45 = C
46 = B

Fill-in-the-blank review questions:

1) The path of blood from the heart, through the lungs, and back to the heart is known as the _____ loop. The path of blood from the heart, to all the organs of the body (except the lungs), and back to the heart is known as the _____ loop.

2) After each description below, write P if it matches the pulmonary loop and write S if it matches the systemic loop. Some blanks may require both answers.

a) It goes to the lungs and back: _____
b) The blood in its arteries is blue: _____
c) Oxygen enters the blood in this loop: _____
d) It begins at the heart: _____
e) The blood in its arteries is red: _____
f) CO_2 is present in some or all of this loop: _____

3) _____ is the term for any blood vessel in the body that carries blood away from the heart.

4) _____ is the term for any blood vessel in the body that carries blood toward the heart.

5) The word _____ refers to lungs, and so the veins returning blood to the heart from the lungs are called the _____ veins.

6) The two uppermost chambers of the heart are the _____.

7) The two lowermost chambers of the heart are the _____.

8) The muscular wall of each _____ (a heart chamber type) is small because its job is simply to pump blood a few inches into the next heart chamber.

9) The right atrium receives blood from two major veins: the superior and inferior _____.

10*) The _____ returns blood from all upper body regions (above the diaphragm) to the right atrium.

11*) The _____ returns blood from all lower body regions (below the diaphragm) to the right atrium.

12) Write T(rue) or F(alse) in each blank space:
a) The ventricles are refilled with blood in diastole_____
b) The semilunar valve is between the atrium and the ventricle_____
c) Blood in pulmonary loop arteries is blue _____
d) The left and right atria contract at the same time_____
e) The left and right ventricles contract at the same time_____

13) After each description, write LV if it applies to the left ventricle, write RV if it applies to the right ventricle, write LA if it applies to the left atrium, and write RA if it applies to the right atrium. Some descriptions may match more than one answer. Write all matching answers.

a) Contracts at the same time as the right ventricle _____

b) Pumps blood out of the heart _____

c) Pumps blood within the heart _____

d) Has semilunar valves at its exit _____

e) Has cardiac muscle walls _____

f) Carries oxygenated blood _____

g) Carries deoxygenated blood _____

14) You are a red blood cell that is about to return to the heart after passing through the systemic loop. Starting with the right atrium as "1", number the following components of the cardiovascular system in the correct order that you would encounter them.

Right atrium 1
Left atrium ____
Right ventricle ____
Left ventricle ____
Pulmonary artery ____
Pulmonary vein ____
Aorta ____
Right AV valve ____
Left AV valve ____
Lungs ____
Aortic semi-lunar valve ____
Pulmonary semi-lunar valve _____

15) Using the list of cardiovascular system parts listed in the problem 14 above as possible answers, list the parts of the cardiovascular system that carry oxygenated blood.

16) The two large arteries leaving the heart (one from the right ventricle and one from the left ventricle) are the _____ and the _____.

17) Most of the work of the heart is performed by the _____ ventricle as it forces blood into the aorta.

18) The larger, more muscular chambers of the heart are the _____ (a chamber type).

19) The _____ (which chamber of the heart?) pumps blood to the lungs; the _____ (which chamber of the heart?) pumps blood to the body via a huge artery called the aorta.

20) The amount of force required to pump blood through the entire body is greater than the force needed to pump blood through the lungs, so the _____ ventricle is larger and more muscular than the _____ ventricle.

21) Blood has to travel further in the _____ loop than in the _____ loop: Because of the difference in loop length, more strength and blood pressure are required to keep it moving in the longer loop.

22) Blood in the pulmonary veins is higher/lower (circle one) in oxygen compared to blood in the pulmonary arteries.

23) The _____ valves separate the atria from the ventricles.

24) The _____ valves are located at the start of the pulmonary artery and the aorta and prevent the back flow of blood into the ventricles.

25) The AV valves and the semilunar valves open and then slam shut with each beat of the heart. This constant opening and closing would damage most tissues, but the heart valves are not harmed because they are made of a very strong and tough leather-like tissue. What tissue are they made out of? (hint: It may help to review the tissue types chapter).

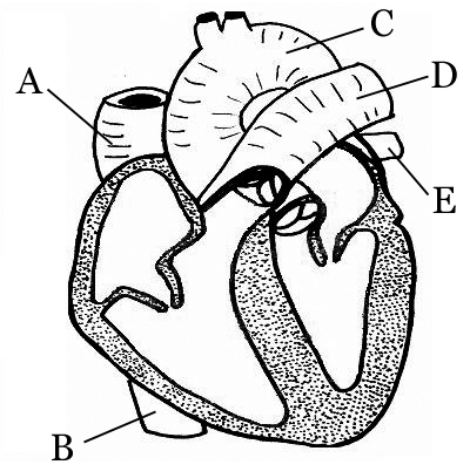
26) There are/aren't (circle one) valves preventing backflow of blood from the atria into the veins that return blood to the heart.

27*) If a valve in the heart malfunctions, and allows blood to flow in both directions, an abnormal heart sound called a _____ occurs.

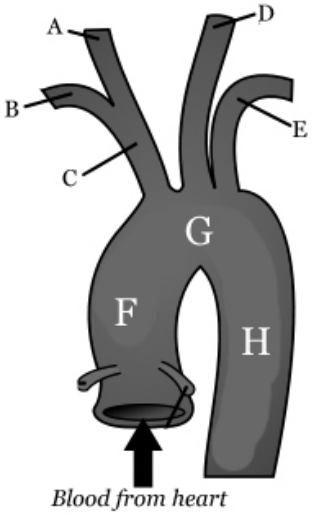
28) The _____ valves prevent backflow from the ventricles into the atria. These valves shut when the ventricles contract/relax (circle one).

29) The _____ valves prevent backflow of blood from the aorta and pulmonary artery into the ventricles. These valves shut when the ventricles contract/relax (circle one).

30*) Name the blood vessels shown in the heart diagram on the right. Hints: All these vessel connect directly to chambers in the heart. A, B, and E are veins. C and D are arteries.



31*) Name the blood vessels shown in the diagram on the right. Hints: F, G, and H are parts of the aorta.



32*) The pulmonary semilunar valve separates the _____ ventricle from the _____ artery.

33*) The aortic semilunar valve separates the _____ ventricle from the _____.

34*) The right AV valve is also called the _____ valve.

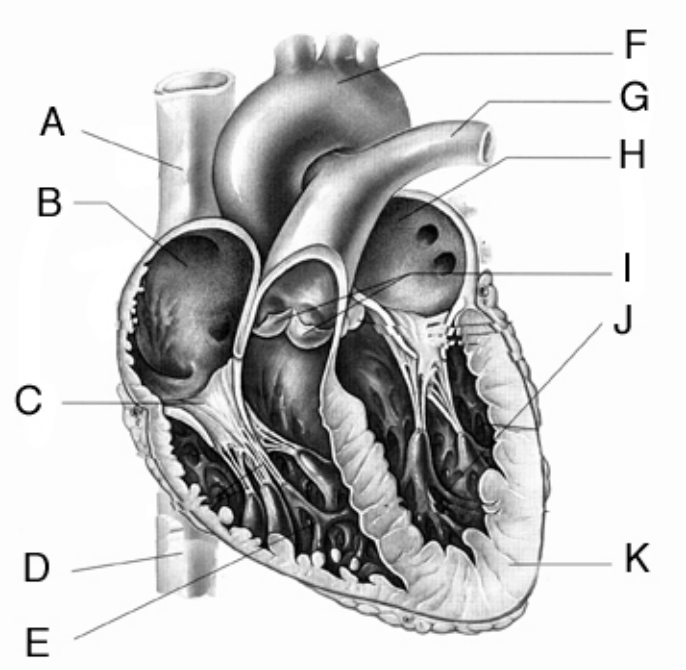
35*) The left AV valve is also called the _____ valve or the _____ valve.

36*) The _____ valves (which make the "dup" noise of the "lub-dup" heartbeat sound) can best be heard by placing a stethoscope at the second intercostal space (which is slightly above the breast).

37*) The _____ valves (which make the "lub" noise of the "lub-dup" heartbeat sound) can best be heard by placing a stethoscope at the fifth intercostal space (which is slightly below the breast).

38) The _____ (which chamber of the heart?) receives blood that has just left the lungs.

39) Name all the lettered parts of the heart below. Letter K is the tissue that the wall of the heart of made out of.



40) _____ refers to the time during which the ventricles of the heart are contracting, while _____ refers to the period of ventricular relaxation.

41) The first heart sound is caused by closure of the _____ valves and the second heart sound is caused by closure of the _____ valves.

42) During ventricular systole, the atria are in _____.

43) At the end of each cardiac cycle, ventricles are in diastole/systole (circle one) and the atria are in diastole/systole (circle one).

44) Write the letters of all descriptions below that occur when the atria begin contracting.

a) Semilunar valves open

b) Ventricles begin systole

c) Ventricles are in diastole

d) AV valves are shut

e) The “lub” sound occurs

f) The “dup” sound occurs

g) The atria are in diastole

45) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the atria begin relaxing.

46) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the ventricles begin contracting.

47) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the ventricles begin relaxing.

48) The heart beat sounds are often described as lub-dup, pause, lub-dup, pause, etc. Write the letters of all events listed below that occur when the lub sound occurs.

a) The atria are relaxing b) The atria are contracting

c) The ventricles are relaxing d) The ventricles are contracting

49) Using the letters from problem 48, write the letters of all events listed below that occur when the dup sound occurs.

50*) Using the letters from problem 48, write the letters of all events listed below that occur during the first part of the pause.

51*) Using the letters from problem 48, write the letters of all events listed below that occur during the second part of the pause.

52) The semilunar valves are open/closed (circle one) during contraction of the ventricles.

53) The first of the two heart sounds ("lub") is due to the _____ valves closing.

54) The second of the two heart sounds occurs when the _____ valves shut.

55) The specialized heart tissue that generates and conducts action potentials to cause the heart chambers to contract and relax is called the _____ tissue of the heart.

56) The normal beating of the heart is initiated by the _____ node, a cluster of conducting tissue in the _____ chamber of the heart. Because this clump of conducting tissue sets the overall heart rate, it is often called the _____ of the heart.

57) After the SA node, the next major clump of conducting tissue is the _____ node. This node receives signals from the SA, and delays briefly, and then sends the signals downward toward the ventricles.

58) The AV node is located in the _____ chamber of the heart.

59) Like neurons, heart cells require the ions Na^+ and K^+ to depolarize and repolarize. But unlike neurons, heart cells also require the ion _____ to depolarize.

60) Abnormal rapid chaotic contraction and relaxation of the heart (when there is no effective pumping of blood) are called _____.

61*) The _____ are the conducting tissues located in the septum of the heart (the septum is the area between the left ventricle and the right ventricle). These conducting tissues pass signals downward from the AV node to the apex (the lower tip) of the heart.

62*)_____ conduct the electrical signals upward from the apex of the heart up into the _____.

63*) A(n) _____ is a recording of all of the electrical activity of the heart.

64*) When taking an ECG of a patient, the electrical leads are attached to which three places?
_____, _____, and _____.

65*) The _____ is the highest, strongest group of waves on a normal ECG.

66*) The QRS complex causes relaxation/contraction (circle one) of the atria/ventricles (circle one).

67*) The first wave on a normal ECG, a small peak, causes relaxation/contraction (circle one) of the atria/ventricles (circle one). This wave is called the _____ wave.

68*) After a brief delay, a third and final wave follows the QRS complex. This third wave is called the _____ wave and it causes relaxation/contraction (circle one) of the atria/ventricles (circle one).

69*) If a _____ wave on an ECG is occasionally not followed by a _____; this indicates a second degree heart block.

70) The central space in a blood vessel through which blood flows is called the _____.

71) The innermost wall of the blood vessels is called the _____ and it is made of _____ (which tissue type?).

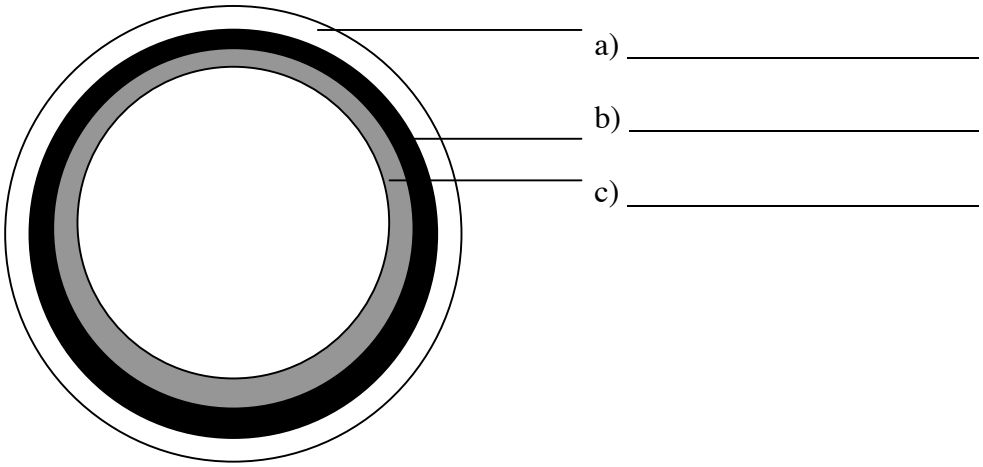
72) _____ is the middle tunic of blood vessels, and primarily consists of _____ tissue.

73) The _____ refers to the outermost layer of the blood vessel wall. Its function is to _____.

74) The outermost layer of blood vessels is composed mostly of _____ tissue.

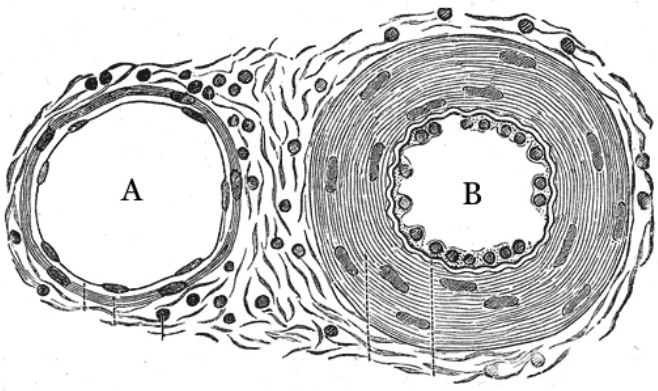
75) _____ (a blood vessel type), because of their thicker muscular layer, have a narrower lumen than the _____ (another blood vessel type).

76) Below is a diagram of a blood vessel. The inner white circle is the lumen (hollow space where the blood flows through). All the other circles are layers of tissue. In each blank label, write the name of the tissue layer and write the type of tissue it is composed of. Be as specific as possible for full credit.



77) Judging from the thinness of the middle layer of the above diagram, the blood vessel is probably an artery/vein (circle one)

78*) The figure below shows an artery and a vein. The artery is blood vessel A/B (circle one letter). The vein is blood vessel A/B (circle one letter).



79) The effect of the contraction of skeletal muscle on blood flow through the veins is often described as the skeletal muscle _____ because it helps to return blood to the heart.

80) To increase the amount of blood flow to an organ, the _____ and _____ (two blood vessel types) undergo _____ (a term that means opening wider).

81) The smallest arteries are called _____.

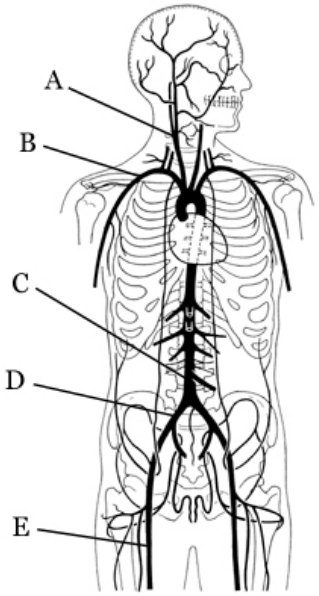
82) The smallest veins are called _____.

83) When the lumen of a blood vessel becomes smaller due to contraction of the smooth muscle in the vessel's wall, the vessel is said to be _____. When the lumen becomes larger due to the muscle relaxing, the vessel is said to be _____.

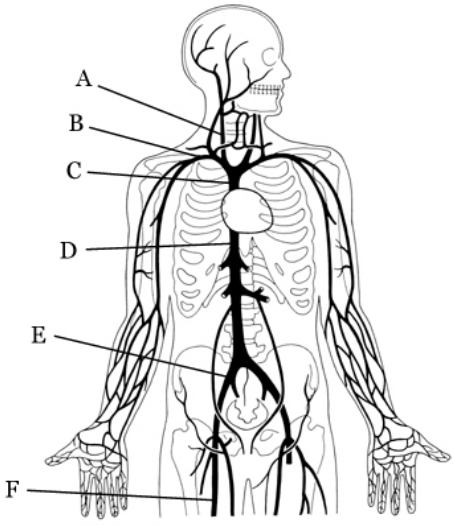
84) Veins, especially those of the limbs, include _____ to prevent blood from flowing backwards.

85) Varicose veins are veins that swell and distend visibly due to damage to their _____.

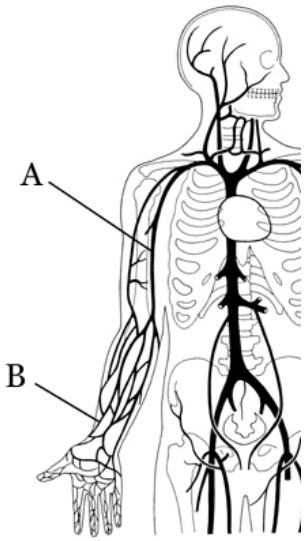
86*) Name arteries A – E in the figure below.



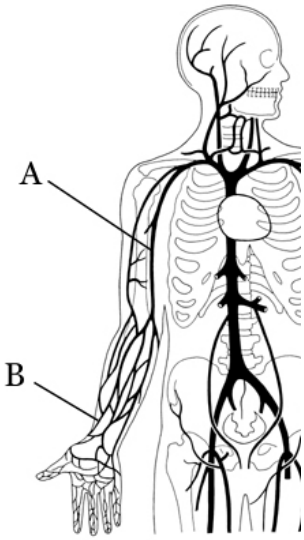
87*) Name veins A – F in the figure below.



88*) Name arteries A – B in the figure below.



89*) Name veins A – B in the figure below.



90) _____ are the tiniest blood vessels. Gases and nutrients in these blood vessels are exchanged with gases and wastes in the tissues.

91) Blood enters the capillaries from _____ vessels and exits the capillaries into _____ vessels.

92) Which tunics that are present in arteries and veins are absent in capillaries? _____

93) Gases and some small molecules can pass directly through the cells of the capillary walls by _____, but larger molecules and WBCs must exit the capillary by _____.

94) What is the average adult resting heart rate? _____

95*) Above the shoulders, the best place to feel the pulse is the _____ artery, which is located on the _____ (which body part?).

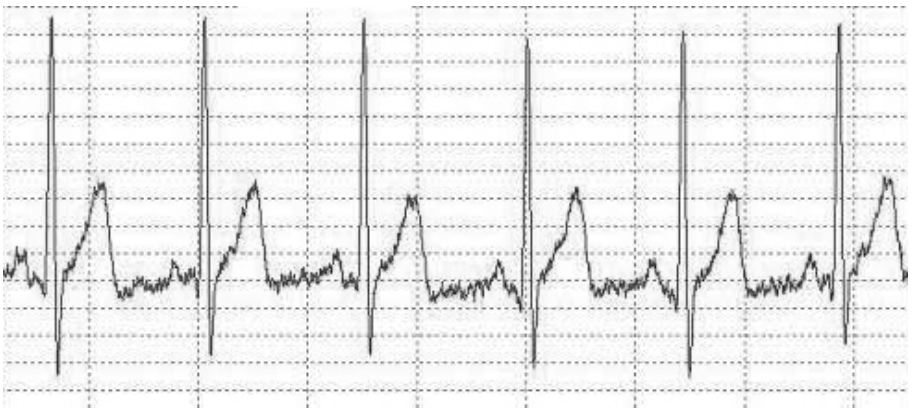
96*) On the forearm, the best place to feel the pulse is the _____ artery, which is located on the _____ (which body part?).

97*) When taking the radial pulse in a patient, which finger do you **not** use to feel the pulse? _____
Why is this finger not used to feel the patient's pulse? _____.

98*) You are taking a patient's pulse. If you feel 37 pulses in 30 seconds, what is the patient's heart rate?

99*) If you took a patient's radial pulse and you felt pulses but the pulses were very weak (in other words, you had difficulty feeling the pulses), the patient has what abnormal condition? _____.

100*) The figure below is an ECG made during a 10 second period. What is the patient's heart rate?



101) The _____ division of the nervous system contains neurons whose function is to accelerate heart rate.

102) The _____ division of the nervous system contains neurons whose function is to decelerate heart rate.

103) Endurance training often results in an increase/decrease (circle one) of the **resting** cardiac rate.

104*) During exercise, the heart rate increases/decreases (circle one).

105) Stroke volume is the amount of blood pumped by each _____ per _____.

106) An average adult's stroke volume is _____.

107) The major factor influencing stroke volume is the _____. (Hint: It relates to a certain volume of blood).

108) If a person started to hemorrhage, their stroke volume would increase/decrease (circle one)

109) The stroke volume can be changed by the _____ of ventricular contraction.

110) Athletic endurance training makes the heart muscle stronger. You would therefore expect that athletes have an increased/decreased (circle one) in the stroke volume.

111) Cardiac output is the amount of blood pumped by _____ in one _____.

112) The formula relating cardiac output, stroke volume and heart rate is _____. (Note: be able to use this formula mathematically)

113) A person has a stroke volume of 100 ml per beat and a heart rate of 60 beats per minute. What is their cardiac output?_____. (For full credit, include the proper units of cardiac output, not just the number).

114) For each factor, state whether it increases or decreases the heart rate:

a) Being older _____

b) Epinephrine _____

c) The parasympathetic nervous system _____

d) These study problems _____

e) Low stroke volume

f) Being female

g) Aerobic exercise (when exercising) _____

h) Regular aerobic exercise (when not exercising)

115) When you exercise, the contractions of your muscles pump more blood back to your heart. This is called the _____ and it increases the _____ (a term meaning the volume of blood that returns to the heart per beat). Increasing the volume of returned blood will increase/decrease (circle one) the stroke volume.

116*) A person has a stroke volume of 100 ml per beat and a resting heart rate of 50 beats per minute.
a) This person is athletic/out of shape (circle one)
b) What is their cardiac output? _____

117) If a person started to hemorrhage, their body would increase/decrease/maintain (circle one of the three) their heart rate in an attempt to increase/decrease/maintain (circle one of the three) their cardiac output.

11**8**) What are the units of blood pressure? _____. What is an average blood pressure reading? _____

119) Blood pressure readings always contain two numbers. The higher is called the _____ pressure and the lower is called the _____ pressure.

120) The blood pressure during the contraction of the ventricles is the _____ pressure, and is normally _____ in a healthy adult.

121) The blood pressure during the relaxation of the ventricles is the _____ pressure, and is normally _____ in a healthy adult.

122*) Blood pressure is always measured in _____ (One of the three types of blood vessels).

123) The blood pressure in the systemic loop is higher/lower (circle one) at the end of the loop compared to the beginning.

124) In an average adult, when the ventricles contract, _____ mmHg of blood pressure is generated. The purpose of this pressure is to eject blood out of the heart.

125*) Blood pressure is measured by using an inflatable cuff device called a _____.

126*) When taking the blood pressure of a patient with the sphygmomanometer, you are measuring the pressure in the patient's _____ artery.

127*) The first sounds heard through the stethoscope (after fully inflating the cuff and then letting a small amount of air out) during a blood pressure measurement are called the sounds of _____. They are caused by _____. The cuff pressure at this point is equal to the patient's _____ pressure.

128*) During a blood pressure determination, the point at which sounds of blood flow can no longer be heard during the release of pressure from the cuff corresponds to the _____ pressure. The blood is flowing smoothly and silently at this point, a type of flow called _____ flow.

129) The blood pressure is proportional to (controlled by) the _____ and the _____

130) The resistance to blood flow by the blood vessels is called the _____.

131) The two things that can change the peripheral resistance are _____ and _____.

132) As blood volume increases, peripheral resistance increases/decreases (circle one).

133) Blood loss causes blood pressure to increase/decrease (circle one).

134) For each pair of terms below, circle the term in that has higher blood pressure or that results in higher blood pressure.

a) Systole/diastole

b) Capillary/Arteriole

c) Large lumen size/small lumen size

d) High blood volume/Low blood volume

e) Relaxation/Stress

f) Low salt diet/High salt diet

g) Vein/Artery

h) Sympathetic/Parasympathetic nervous systems

135) Two of the factors that affect blood pressure are blood volume and lumen size.

a) If blood volume increases, blood pressure will increase/decrease (circle one)

b) If lumen size increases, blood pressure will increase/decrease (circle one)

c) Eating a diet that is high in sodium will increase your blood pressure. The sodium increases blood pressure by changing lumen size/blood volume (circle one).

d) Eating a diet that is high in fat will increase your blood pressure. The fat increases blood pressure by changing the lumen size/blood volume (circle one).

136) The larger/smaller (circle one) the blood vessel diameter, the higher the peripheral resistance. (Note: be able to use this concept and be able to interpret the answer as to whether blood pressure went up or down.)

137) The sympathetic nervous system can raise blood pressure by causing _____ of blood vessels.

138) The _____ (a pair of organs) are the major organs that adjust blood pressure.

139) The kidneys can increase blood pressure by adding _____ to the blood, which increases blood volume through osmosis.

140) Another way the kidneys can increase blood pressure is by releasing the protein _____, which leads to the activation of the powerful vasoconstrictor protein _____.

141) Sodium in the diet increases your blood pressure by increasing the blood volume. Sodium increases the blood volume by drawing water from the tissues into the blood using the process of _____.

142) Excess fat in the diet increases your blood pressure because it increases _____.

143) _____ is the clogging of blood vessels (especially coronary arteries) by fatty deposits.

144) _____ is chronically increased by atherosclerosis because fatty deposits called _____ make the lumen smaller, which increases _____.

145) Eating foods with high levels of _____ (a lipid molecule) is a major cause of atherosclerosis.

146) Although aging does lead to changes in the heart, the general consensus is that _____ and _____ (two unhealthy lifestyle choices), not aging, are usually the main causes of cardiovascular disease.

147) Long-term high blood pressure (_____) damages the heart and, in untreated, eventually can cause congestive heart failure.

148) Blood pressure is in the 'hypertensive' range when it is _____ or greater. (Give the exact blood pressure numbers).

149) _____ refers to a condition in which the heart is weak. Its pumping efficiency is sufficient to keep the person alive but inadequate to keep them in good health.

150) In a person with congestive heart failure, fluid will accumulate in the _____ and in the _____ (two regions of the body).

151) Fluids build up in the lungs of congestive heart failure victims. This is because the left/right (circle one) ventricle tends to weaken more than the other ventricle, so blood pools in the pulmonary loop.

152) A blood clot in an unbroken blood vessel is called a(n) _____, and a blood clot in a blood vessel can easily become a(n) _____, which means anything that can block a blood vessel.

153) A heart attack is caused by sudden blockage of the _____ arteries.

154) Unexplained pain in the left arm should be treated seriously because it may be _____.

155) A heart attack is also called a _____ or a _____.

156) The _____ arteries deliver oxygen-rich blood to the muscles of the heart itself.

157) During a myocardial infarction, chest pain called _____ is often also felt as pain in the _____.

158) If a person has coronary artery disease, doctors can insert an inflatable balloon-like device into the clogged artery to push aside the blockage. This procedure is called _____.

159) Atherosclerosis (clogging of the arteries with fat) can lead to two disorders that cause the heart to not work correctly: A heart attack and congestive heart failure. These two disorders, however, are very different in terms of what goes wrong in the heart and what their symptoms are. After each description below, write and H if it matches a heart attack and write C if it matches congestive heart failure. Some blanks may require both answers.

a) It comes on suddenly: _____

b) Angina pectoris is a symptom: _____

c) The blood does not circulate as well as is needed by the body: _____

d) Fatigue and swollen legs are common symptoms: _____

e) It is caused by the heart slowly wearing itself out over many years: _____

f) It is caused by a blood vessel in the heart becoming suddenly blocked: _____

g) A person with a low fat but high salt diet would be at risk for it: _____

160) Up and down pressure, applied by the hands of a rescuer to the chest of a person without a heart beat, is known as _____.

161) The term _____ means hypoperfusion (too little blood flow) to the organs because of decreased blood volume.

162) One major cause of shock is loss of _____ from the body.

163) The rapid fall in blood volume and pressure that occurs as a result of a severe allergic reaction (such as to bee stings, penicillin, or peanuts) is called _____ shock.

164) Anaphylactic shock occurs because certain immune cells release the molecule _____, which causes excessive vasodilation and leaky blood vessels.

Answer to fill-in-the-blank review questions:

1) Pulmonary loop
   Systemic loop
2) P
   P
   P
   PS
   S
   PS
3) Artery
4) Vein
5) Pulmonary
   Pulmonary
6) Atria
7) Ventricles
8) Atrium
9) Vena cava
10) Superior vena cava
11) Inferior vena cava
12) a) T
    b) F
    c) T
    d) T
    e) T

13) a) LV
    b) RV, LV
    c) RA, LA
    d) RV, LV
    e) RA, LA, RV, LV
    f) LA, LV
    g) RA, RV

14) 1
    8
    3
    10
    5
    7
    12
    2
    9
    6
    11
    4

15) Left Atrium
    Left ventricle
    Pulmonary vein
    Aorta
    Left AV valve
    Lungs
    Aortic semi-lunar valve

16) Pulmonary artery
    Aorta
17) Left
18) Ventricles
19) Right ventricle
    Left ventricle
20) Left
    Right
21) Systemic
    Pulmonary
22) Higher
23) Atrioventricular (AV)
24) Semi-lunar
25) Dense connective tissue
26) Aren't
27*) Murmur
28) AV values
    Contract
29) Semi-lunar
    Relax
30*) A = Superior vena cava
     B = Inferior vena cava
     C = Aorta
     D = Pulmonary artery
     E = Pulmonary vein

31*) A = Right common carotid artery
     B = Right subclavian artery
     C = Brachiocephalic artery
     D = Left common carotid artery
     E = Left subclavian artery
     F = Ascending aorta
     G = Aortic arch
     H = Descending aorta

32*) Right ventricle
Pulmonary artery
33*) Left ventricle
Aorta
34*) Tricuspid valve
35*) Bicuspid
Mitral
36*) Semilunar valves
37*) AV valves
38) Left atrium
39) A = Superior vena cava
B = Right atrium
C = Right AV valve (tricuspid valve)
D = Inferior vena cava
E = Right ventricle
F = Aorta
G = Pulmonary artery
H = Left atrium
I = Pulmonary semilunar valve
J = Left ventricle
K = Cardiac muscle

40) Systole
Diastole
41) AV valves
Semilunar
42) Diastole
43) Diastole
Diastole
44) c
45) a, b, d, e, g
46) a, b, d, e, g
47) c, f, g
48*) a, d
49*) a, c
50*) a, c
51*) b, c
52) Open
53) AV valve
54) Semilunar valve
55) Conducting tissue
56) SA (sino-atrial) node
Right atrium
Pacemaker
57) AV (atrio-ventricular)
58) Right atrium
59) Ca^{2+}
60) Fibrillations
61*) Bundles of His
62*) Purkinje fibers
63*) ECG (electrocardiogram)
64*) Left wrist
Right wrist
Ankle
65*) QRS
66*) Contraction
Ventricles

67*) Contraction
Atria
P wave
68*) T wave
Relaxation
Ventricles
69*) P wave
QRS wave complex
70) Lumen
71) Tunica interna
Simple squamous
72) Tunica media
Smooth muscle tissue
73) Tunica externa
Protect the blood vessel
74) Dense connective tissue
75) Arteries
Veins
76) a) Tunica externa, Dense connective tissue
b) Tunica media, Smooth muscle tissue
c) Tunica interna, Simple squamous epithelial
77) Vein
78*) B
A
79) Pump
80) Arteries
Arterioles
Dilation
81) Arterioles
82) Venules
83) Contracted
Dilated

84) One-way valves
85) One-way valves
86*) A = Right common carotid artery
B = Right subclavian artery
C = Abdominal aorta
D = Right iliac artery
E = Right femoral artery

87*) A = Right jugular vein
B = Right subclavian vein
C = Superior vena cava
D = Inferior vena cava
E = Right iliac vein
F = Right femoral vein

88*) A = Right brachial artery
B = Right radial artery

89*) A = Right brachial vein
B = Right radial vein

90) Capillaries
91) Arteriole
Venule
92) Tunica externa
Tunica media
93) Diffusion
Gaps in capillary wall
94) 72 beats per minute (bpm)
95*) Carotid artery
Neck
96*) Radial artery
Wrist
97*) Thumb
The thumb has its own pulse that might be
mistaken for the patient's pulse.
98*) 74 beats per minute
99*) Very low blood pressure
100*) 36 beats per minute
101) Sympathetic
102) Parasympathetic
103) Decrease
104*) Increases
105) Ventricle
Beat
106) 70 ml/beat
107) Venous return
108) Decrease
109) Strength
110*) Increase
111) Heart
Minute
112) CO = SV x HR
113) 6000 ml/minute
114) Decrease
Increase
Decrease
Increase (if they frighten you!)
Increase
Increase
Increase
Decrease

115) Skeletal muscle pump
Venous return
Increase
116*) Athlete
5000 ml/minute
117) Increase
Maintain

118) mmHg (millimeters of mercury)
120/80 mmHg
119) Systolic
Diastolic
120) Systolic
120 mmHg
121) Diastolic
80 mmHg
122*) Arteries
123) Lower
124) 120
125*) Sphygmomanometer
126*) Brachial artery
127*) Korotkoff
Turbulent flow (flow only during systole)
Systolic
128*) Diastolic
Laminar

129) Cardiac output
Peripheral resistance
130) Peripheral resistance
131) Blood volume
Lumen size
132) Increases
133) Decrease
134) Systole
Arteriole
Large lumen size
High blood volume
Stress
High salt diet
Artery
Sympathetic nervous system

135) Increase
Decrease
Blood volume
Lumen size
136) Smaller
137) Contraction
138) Kidneys
139) Sodium
140) Renin
Angiotensin II
141) Osmosis
142) Peripheral resistance
143) Atherosclerosis
144) Blood pressure
Plaques
Peripheral resistance
145) Cholesterol
146) High fat diet
Smoking
147) Chronic hypertension
148) 140/90 mmHg
149) Congestive heart failure
150) Lungs
Legs
151) Left ventricle
152) Thrombus
Embolus
153) Coronary
154) Heart attack
155) Myocardial infarction
Coronary
156) Coronary
157) Angina pectoris
Left arm or left shoulder
158) Angioplasty
159) a) H
b) H
c) HC
d) C
e) C
f) H
g) C

160) Cardiopulmonary resuscitation (CPR)
161) Shock
162) Blood
163) Anaphylactic shock
164) Histamine

Short answer review questions:

1) Blood is sometimes blue and sometimes red. What is it that determines whether the blood is red or blue?

2) The SA node in the heart sends signals to contract the atria. The AV node receives the contraction signal from the SA node, delays a moment, then sends the signal to contract the ventricles. Explain why the AV node delays before sending the contraction signal to the ventricles.

3) Arteries have a thick tissue layer in their wall called the tunica media. What type of tissue is the tunica media and what is its main function?

4) Although the heart is the major pump that circulates the blood, there is a second system that the body uses to help push blood in veins back to the heart. Describe this system (a diagram may be helpful) and state why it could not function in arteries and capillaries.

5) Capillaries deliver oxygen to the cells of the tissues. However, the oxygen in the capillary does not go directly from the capillary to the cells of the tissue. What substance does the oxygen pass through between the capillary and the cell, and where does this substance come from?

6) CO_2 and antibodies (a type of large protein molecule in the blood) can both move between the blood in the capillaries and the tissue fluid. But each molecule uses a different method of passing through the capillary wall. For each molecule, state how it passes through the capillary wall and also state why it uses that particular method of passage (and not some other method).

7) Unlike skeletal muscle, cardiac muscle does not get its contractions signals from neurons. Nevertheless, there are motor neurons that synapse with the heart (mostly in the right atrium). What are the names of these motor neurons and what is their function?

8) Blood pressure is always given as two numbers. Explain what makes the first number higher than the second.

9) The sympathetic nervous system can increase blood pressure in several ways, including increasing cardiac output. Describe in detail one way that the sympathetic division increases blood pressure that does **not** involve the heart.

10) Explain at a molecular level how sodium in the diet increases your blood pressure.

11) Explain at a blood vessel level how the fat in the diet increases your blood pressure.

12) Explain all the ways the kidneys counteract low blood pressure. Your explanations should include exactly what the kidneys add to the blood and how this raises the blood pressure.

13) To treat shock, doctors sometimes inject “plasma expanders” into the patient. Plasma expanders are large solutes (such as starch or proteins) that are too large to exit the blood vessels. Explain at a molecular level how plasma expanders treat shock.

Answers to short answer review questions:

1) The amount of oxygen determines blood color. Blood that is high in oxygen is red, whereas blood that is low in oxygen is blue.

2) The AV node delays the contraction signal to give time for the atria to fill the ventricles with blood.

3) The tunica media is smooth muscle. Its main purpose is to act as a valve for the blood vessel. If the body needs less blood flow to an organ, the smooth muscle of that organ's arteries constricts, reducing the lumen size (and therefore decreasing the blood flow). If the body requires more blood flow to an organ, the smooth muscle of that organ's arteries relaxes, increasing the lumen size (and therefore increasing the blood flow).

4) The second "pump" of the blood is the skeletal muscles pump. Whenever we use our skeletal muscles, they squeeze on the veins inside the muscles. This propels the blood in the veins in only one direction: Back toward the heart. This is because veins have one-way valves that point toward the heart. Capillaries and arteries lack valves and therefore cannot be used by the skeletal muscle pump.

5) The oxygen (and all other molecules that the capillaries supply to the cells) first enters the tissue fluid before it enters the cells themselves. The tissue fluid is a watery liquid that surrounds all the cells of the body. All materials that exit the capillaries first dissolve into the tissue fluid. The tissue fluid comes from the plasma (the watery part of the blood) that has leaked through tiny openings in the capillary wall.

6) The CO_2 diffuses through the cells that make up the capillary wall, whereas antibodies pass through small gaps between the cells of the capillary wall. The size of the molecules explains the difference: Small molecules (especially non-polar ones like CO_2) can pass easily through a cell membrane. Large molecules (like antibodies and other proteins) are much too large to diffuse through a cell membrane, and must instead use the gaps in the capillary wall to exit the blood vessel.

7) The motor neurons that synapse with the heart are the motor neurons of the sympathetic and the parasympathetic divisions of the nervous system. Although they do not directly cause the heart muscle cells to contract, they do affect the rate that the SA node (the heart's pacemaker, located in the right atrium) sends contraction and relaxation signals to the heart.

8) The first and higher blood pressure number is called the systolic pressure. It is the blood pressure when the heart is contracting on the blood. The second and lower blood pressure number is called the diastolic pressure. It is the blood pressure when the heart is relaxing. The systolic pressure is always higher because the pressure of any liquid is increased by squeezing the liquid, and that is what happens when the heart contracts during systole.

9) The sympathetic nervous system can increase blood pressure by causing contraction of the tunica media (smooth muscle layer) of many arteries. This decreases the lumen size of the blood vessel, which increases peripheral resistance, which increases blood pressure.

10) Sodium in the diet causes high sodium levels in the blood. The high sodium draws water by osmosis into the blood from surrounding tissues. This increases the blood volume, which increases peripheral resistance, which increases blood pressure.

11) Fat in the diet causes plaques (fatty deposits in the blood vessels). Since the plaques partially block the blood vessel, they effectively make the lumen smaller. Smaller lumen size increases peripheral resistance, which increases blood pressure.

12) When the blood pressure is low, the kidneys can add sodium to the blood. The sodium increases blood volume by adding water to the blood via osmosis. The kidneys can also increase blood pressure by adding the protein rennin to the blood. Renin leads to the activation of a protein called angiotensin II. The angiotensin II increases blood pressure by causing vasoconstriction (a decrease of the lumen size of blood vessels, which increases blood pressure by increasing peripheral resistance) and also by causing the adrenal gland to release the hormone aldosterone, which causes the kidneys to add sodium to the blood.

13) Shock is hypoperfusion due to low blood volume. Plasma expanders counteract shock by increasing blood volume. The solutes of plasma expanders (such as starch and proteins) are too large to exit the blood vessel. These solutes therefore increase the solute concentration of the blood and thereby draw water into the blood by osmosis.